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TITLE: Children's Hospital Integrated Patient Electronic Record System (CHIPERS) Continuation

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14. ABSTRACT

This is a prospective study of patients at Children's Hospital & Research Oakland before and after the implementation of an EMR/CPOE/CDS system. We are enrolling patients in the Pediatric ICU with severe sepsis/shock (Specific Aims 1 and 3) and patients in the Newborn ICU requiring prolonged parenteral nutrition (Specific Aim 2). Our goal is to determine a) whether CDS is an appropriate tool for managing complex patients in the intensive care environment, and b) how environmental and systems factors influence the decisions to follow established clinical guidelines. Our major outcomes include algorithm compliance and other important patient outcomes such as resolution of shock, length of ICU stay, death. Our study has 3 phases. Phase 1 is now complete. This phase included "baseline" patient identification, assessment of compliance with national and international management algorithms and patient outcome. Phase 2 is currently underway and includes the implementation of hospital-wide paper-based management guidelines and focus groups to identify human and systems barriers to guideline implementation. Phase 3 will commence after the planned hospital transition to the EPIC EHR in Fall 2013. We are currently working with key EPIC leaders to determine best methodology to effectively implement these time-sensitive clinical decision support tools.

15. SUBJECT TERMS
clinical decision support, electronic health record, pediatric critical care, neonatal intensive care

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Table of Contents

Introduction

This project **AWARD#W81XWH-10-01-0682** is a continuation of **AWARD#W81XWH-09-01-0704.**

Electronic medical record (EMR) systems are being deployed extensively throughout the United States. In addition to storing clinical data, EMR systems integrate computerized order entry (CPOE). The integration of CPOE into the EMR also provides the opportunity to include clinical decision support (CDS) systems, where diverse clinical data are used to provide algorithm-based feedback to caregivers. CPOE with integrated CDS has been shown to improve some aspects of medical care such as accuracy of pharmacy orders. However, whether CDS can improve care in more complex, *time-sensitive* areas such as the management of patients with severe sepsis/shock, or patients requiring long term parenteral nutrition, is unknown. Some studies have shown that the introduction of EMR/CPOE/CDS actually worsens patient outcomes, particularly in the intensive care unit. This is a prospective comparison of the management and outcomes of patients at Children's Hospital & Research Oakland before and after the implementation of an EMR/CPOE/CDS system. We are enrolling patients in the Pediatric ICU with severe sepsis/shock (Specific Aims 1 and 3) and patients in the Newborn ICU who require prolonged parenteral nutrition (Specific Aim 2). Our goal is determine whether CPOE with CDS is an appropriate tool for managing complex patients in the intensive care environment, as well as determine how environmental and systems factors influence the decisions to follow established clinical guidelines. Determining the factors influencing use of time-sensitive clinical guidelines is highly likely to be generalizable to other critical care environments. Similarly, if we can show that electronic CDS improves outcomes compared to well-designed clinical practice guidelines, this suggests that CDS can be a powerful tool for improving the care provided by front-line clinicians to critically ill patients with complex medical needs in other diverse environments.

Body

The objectives of this project are:

- Test the hypothesis that implementation of an EMR/CPOE/CDS system will improve compliance in treating children with severe sepsis and/or shock with the ACCM and CHRCO Clinical Guidelines for Hemodynamic Support of Neonates and Children with Severe Sepsis and Septic Shock **(Specific Aim 1).**
- Test the hypothesis that implementation of an EMR/CPOE/CDS system will decrease time to reversal of shock, decrease duration of mechanical ventilation, decrease duration of vasoactive medication administration, decrease incidence of multiple organ system failure, and decrease hospital and PICU length of stay **(Specific Aim 1).**
- Test the hypothesis that implementation of an EMR/CPOE/CDS system will improve compliance in treating VLBW NICU patients with the Children's Hospital guidelines for nutritional support of VLBW infants **(Specific Aim 2).**

- Test the hypothesis that implementation of an EMR/CPOE/CDS system will improve nutritional status of VLBW infants in the NICU, including improve growth, decrease protein debt, and decrease caloric debt by the time of hospital discharge **(Specific Aim 2).**
- Systematically evaluate the factors that influence whether clinicians follow clinical guidelines, and use this information to drive the design of the CPOE/CDS elements of the EMR **(Specific Aim 3).**

This project involves three phases of study as follows:

- **Phase 1 (July 2010 through Winter 2011/2) – This phase has been completed.**
  Phase 1 is the baseline period during which we have general guidelines without formal CPGs or order sets. During this phase we collected data on compliance with the guidelines and clinical outcomes. We also evaluated clinicians' understanding of current sepsis and nutritional support guidelines to develop an understanding of the current workflow and decision-making processes.

    - Collect data on compliance with guidelines and clinical outcome of PICU patients with severe sepsis/septic shock - **completed**
    - Collect data on compliance with guidelines and clinical outcome of NICU VLBW patients requiring parenteral nutrtion - **completed**
    - evaluate current practice and clinical decision-making culture and process in PICU patients with severe sepsis/septic shock - **complete**
    - Evaluate current practice and clinical decision-making culture and process in nutritional management of NICU VLBW patients - **complete**

- **Phase 2 (Winter 2011/2 through Autumn 2013) – We are currently in this phase.**
  Phase 2 is a phase of CPGs and order sets on paper. These CPGs and order sets will be based on the information gathered in Phase 1. During Phase 2 we are collecting structured data on clinicians' decision making as we did in Phase 1, and data on compliance with guidelines and clinical outcome.

    - Analyze data from Phase 1 and implement non-electronic (ie paper-based) decision support tools in pediatric sepsis/shock and NICU VLBW nutrition patients
    - Complete the PICU sepsis/shock and NICU VLBW nutrition EMR/CPOE/CDS modules
    - Finalize design of PICU sepsis/shock and NICU VLBW nutrition EMR/CPOE/CDS modules
    - Orient staff to new EMR/CPOE/CDS system hospital-wide and to major referring pediatric practices
    - Screen and enroll all patients admitted to the CHRCO PICU meeting criteria for severe sepsis/septic shock and collect data on compliance with guidelines, clinical outcomes, and clinical-decision making as in Phase 1

- Initiate meetings with our EPIC representatives on the timing of, plan for adapting CDS into the EPIC EMR platform (Phase 3) and plan for ultimate refinement of the interactive CDS tools.

- **Phase 3 (Autumn 2013 through December 2014) – To be completed.**
  Phase 3 will be the post-EMR/CPOE/CDS period when the CPGs and order sets developed for Phase 2 are integrated into the new EMR system. As in Phases 1 and 2, we will collect structured data on clinicians' decision making as well as data on compliance with the guidelines and clinical outcome.

  - Implement new EMR/CPOE/CDS system at Children's Hospital
  - Complete data collection on compliance with guidelines, clinical outcomes, and clinical-decision making as in Phases 1 and 2

All of our specific aims will be completed by comparing the management of a cohort of patients treated *after* the implementation of our EMR/CPOE/CDS system to age-matched and severity-of- illness-matched controls treated *before* the EMR/CPOE/CDS system implementation.

Problems Encountered in the Research Project to date:

The greatest impediment to this project to date has been the long timeline required for CHRCO to secure an appropriate contract with an EMR vendor. Initially, letters of intent were submitted for a contract with the Cerner EMR system, but that attempt failed. Finally, after lengthly negotiations, the hospital has contracted with and we are actively moving toward a conversion to the EPIC EMR platform with an estimated "go live" date of Fall/Winter 2013. Many hospital employees, including our prior research nurse coordinator, have transitioned to full time employment with the EPIC transition. Accordingly, we have revised and augmented our co-investigator and nurse coordinator pool. Similarly, with the new "go live" date of September, 2013, we have extended the project timeline. From a research perspective, this extended timeline for the Epic conversion is very beneficial as it has allowed us an excellent opportunity to enroll more patients in each study cohort, which in turn allows for improved analysis of the incremental changes observed in patient outcome and management algorithm compliance across each of the study phases and for both patient cohorts (pediatric sepsis/septic shock patients and for very low birth weight infants).

Accomplishments according to proposed specific aims (tasks):

We remain active in the **Phase 2** portion: Development and testing of "paper" CDS. Importantly, we have also initiated meetings with our EPIC representatives on the timing of, plan for adapting the CDS into the EPIC EMR platform **(Phase 3)** and plan for ultimate refinement of the interactive tools to allow for best compliance and best patient outcomes.

Specific Aim 1: *Test the utility of an EMR/CPOE/CDS system in providing closed loop feedback and decision support in the management of children with severe sepsis and/or septic*

shock at the time of presentation to the hospital, and as the patient moves across different departments within the hospital. We will test the hypothesis that implementation of an EMR/CPOE/CDS system will improve compliance in treating children with severe sepsis and/or shock with the American College of Critical Care Medicine (ACCM) and Children's Hospital & Research Center Oakland Clinical Guidelines for Hemodynamic Support of Neonates and Children with Severe Sepsis and Septic Shock. We will test the hypothesis that implementation of an EMR/CPOE/CDS system will decrease time to reversal of shock, decrease duration of mechanical ventilation, decrease duration of vasoactive medication administration, decrease incidence of multiple organ system failure, and decrease hospital and PICU length of stay.

a) The dataset for Phase 1 has been closed this past year. Preliminary analysis of the patients enrolled in Phase 1 include 47 pediatric patients meeting severe sepsis/septic shock criteria. These patients originated from the CHRCO wards (11%), the CHRCO Emergency Department (45%) and from outside referring centers (38%). Additional clinical data follows:

Age	7.9 y (mean)	2.5 mo-17yo (range)	
Male	32%	15/47	
pH (n=34, 72%)	7.34 (median)	6.88-7.5 (range)	38% < 7.30
Lactate (n=29, 62%)	2.55 (median)	0.6-9.1	34% > 3.0
Dopamine	38%	18/47	
Norepinephrine	28%	13/47	
Epinephrine	11%	5/47	
Central Line Placed	60%	28/47	

Median length of stay in the PICU was 4d (range 0-50d). Median hospital length of stay was 8d (range 0-279d). Disposition of these patients included death (11%), discharge to home (87%) and transfer to another institution (2%).

b) Our investigator group continues to meet weekly to review progress and continue with future planning as follows. We completed our Severe Sepsis/Septic Shock Patient Assessment Tool and Management Algorithm. We continue to *actively* disseminate the severe sepsis/septic shock "paper" clinical decision support algorithm hospital-wide. We have successfully augmented our Co-Investigator pool to provide "divisional champions" to disseminate our CDS hospital-wide at the primary locations that our patients with severe sepsis present (**Specific Aim 1**.) Our project now reflects a co-investigator pool that includes physician and nursing staff representatives from the CHRCO Emergency Department, Hematology-Oncology, General Inpatient Pediatrics and Pediatric Intensive Care. Our investigator pool continues to work closely with physician leadership and hospital nurse educators on the best "tools" to educate the nursing, physician and pharmacy staff in smaller venues and with more "hands on" activities. This has included:

a) Hands-on demonstrations of EZ intraosseous placement,

b) Finalized paper versions of our Severe Sepsis Patient Assessment Tool and Severe Sepsis Management Algorithm have been placed in each in-patient chart and on the emergency "Code Blue" carts for easy reference.
c) We created a GOTO lecture that was made available to hospitalists and nurses unable to attend any of the lectures in person.
d) The CPG and sepsis assessment tool has been placed in all patient charts and Code Carts on the wards.
e) Laminated cards with the sepsis algorithm have been created for clinicians to place on their ID badge lanyards.
f) We have and will continue to present our Severe Sepsis Patient Assessment and Severe Sepsis Clinical Decision Support algorithm in lecture format at all Nursing Skills Days and New Nurse Orientation programs, all PALS (pediatric advanced life support) courses as well as individual presentations at physician faculty meetings. The Severe Sepsis Education has been added in 2012 as the nurse "High Risk Low Volume" educational focus hospital-wide.
g) We distributed the Severe Sepsis Patient Assessment and Severe Sepsis Clinical Decision Support algorithm electronically to all faculty with other pertinent educational materials on World Sepsis Day, September 13, 2012.
h) A paper Severe Sepsis Order Set has been created and accepted for use in the CHRCO Emergency Department for patients meeting severe sepsis criteria.

c) In the wake of our initial approvals from the CHRCO Best Practice and Code Blue Committees, our progress is tracked and presented semi-annually at these committees as well.

d) We continue to work with the CHRCO PALS educators on aligning education on PALS shock management with those of the Severe Sepsis Campaign. Our plan to incorporate our Pediatric Surviving Sepsis algorithm to the CHRCO PALS curriculum has been endorsed by leaders of the American Heart Association PALS programming committee (see electronic communication attached).

e) We will continue independent review of 10% of all cases identified to adjudicate accurate data extraction. Data from the Phase 1 cohort will be analyzed.

f) Our investigators, particularly Drs. Robert Heidersbach, David Durand and Heidi Flori, continue active involvement in the hospital-wide EPIC transition. Dr. Heidersbach is an EPIC "subject matter expert" and Dr. Durand hosts the CHRCO "Medical Informatics Scientific Advisory Committee" meetings wherein all EPIC transition planning currently occurs. All have attended EPIC Validation Sessions pertinent to our research Specific Aims and Hypotheses. We have met with EPIC representatives to discuss in detail how best to incorporate our Severe Sepsis Clinical Decision Support tool and to transform it from its current "passive" CDS role to an "active" CDS tool at or shortly after our hospital converts to the EPIC platform in Autumn 2013.

g) We continue to refine the Access database for the Severe Sepsis cohort with continued independent review of 10% of all cases identified to adjudicate accurate data extraction. We have "closed" the database for all patients identified during Phase 1 of the study.

Future Directions Specific Aim 1:

1) The phase 1 data set final analyses will be completed in the coming months. Phase 2 data entry and cleanup will continue in a multi-relational Access database created and maintained by Drs. Flori and Durand.

2) We are continuing to solidify our relationships with the EPIC personnel, attend appropriate Validation Sessions and determine how best to create and validate our interactive, electronic CDS tool as we transition to EPIC next Fall. Specifically, we continue to discuss best timing for rolling out the CDS tool after the main EPIC hospital go live date as well as plans to implement, refine and validate the interactive, electronic CDS tool.

3) We will continue to interface with nurse educators for the hospital as well as our expanded Co-Investigator pool to enhance didactic education around the sepsis assessment tool and the sepsis CPG.

4) We continue to augment our education to outside clinicians that frequently refer patients to CHRCO, include referring Emergency Departments, general pediatric practices with admitting privileges to CHRCO and CHRCO pediatric hospitalists that provide care at satellite locations including Alta Bates Summit Hospital, etc. This education will include wider dissemination of our sepsis "GoTo meeting" type lectures, electronic communication via the CHRCO faculty email system and paper communication via our CHRCO publications.

5) We will continue to refine our CDS and our rapid sepsis response "system." Under consideration now and in the next quarter include insuring Pharmacy team members attend all Rapid Response Team activations with the antibiotics in hand so as to comply with time sensitive antibiotic administration requirements. We are also entertaining mechanisms to insure more rapid placement of central venous access for patients presenting outside the ICU environment. Lastly, we continue to work with the CHRCO PALS educators on aligning education on PALS shock management with those of the Severe Sepsis Campaign. These results will be forwarded to national PALS leadership.

6) We will continue independent review of 10% of all cases identified to adjudicate accurate data extraction. Data from the Phase 1 cohort will be analyzed.

Specific Aim 2: *Test the utility of an EMR/CPOE/CDS system in providing closed loop feedback and decision support in the nutrition management of very low birth weight (VLBW) infants in the newborn intensive care unit (NICU). We will test the hypothesis that implementation of an EMR/CPOE/CDS system will improve compliance in treating VLBW NICU patients with the CHRCO guidelines for nutritional support of VLBW infants. We will test the hypothesis that implementation of an EMR/CPOE/CDS system will improve*

nutritional status of VLBW infants in the NICU, including improve growth, decrease protein debt, and decrease caloric debt by the time of hospital discharge.

We have continued in the "paper-based" phase of NICU nutritional clinical guidelines. Resident education, "on paper" clinical guidelines, and nutritional targets remain them same. Nutrition data from the nutrition database continues to be reviewed daily by the attending and resident physician staff on rounds. Structured education about the nutrition goals continues to be given to all residents during their first 48 hours of their NICU rotation. The minimal amount of decision support in the current MediTech parenteral nutrition remains unchanged. We continue to collect detailed data on actual nutrition delivered and growth achieved in the nutrition database.

All patients are enrolled in a multi-relational Access database created and maintained by Dr. Durand. Preliminary analysis of the "baseline" NICU nutritional project revealed that from April 2010 through September 2011, 46 infants with birthweight less than 1.5 kg were admitted to the CHRCO NICU within the first week of life for a total of over 3000 patient days.

The data collection for the "paper-based" phase of the NICU nutrition project will continue. We anticipate further discussions with the Epic EMR implementation team around the clinical decision support options within Epic. Initial work on the design of the clinical decision support and nutrition reporting will begin in the next quarter. Actual development of the clinical decision support and reporting may begin next quarter, although the bulk of it will be done in the following two quarters.

Drs. Durand and Heidersbach have begun discussions with the Epic implementation team around how NICU nutritional support might be integrated into the Epic EMR.

Future Work Specific Aim 2:

Final analysis of the "baseline" patient cohort will be completed. The data collection for the "paper-based" phase of the NICU nutrition project will continue. We anticipate further discussions with the Epic EMR implementation team around the clinical decision support options within Epic. Initial work on the design of the clinical decision support and nutrition reporting will begin in the next quarter. Actual development of the clinical decision support and reporting may begin next quarter, although the bulk of it will be done in the following two quarters.

Specific Aim 3*: Systematically evaluate the factors that influence whether clinicians follow clinical guidelines, and use this information to drive the design of the CPOE/CDS elements of the EMR.*

We have continued to work closely with Dr. Jennifer Plant, originally a member of the CHRCO faculty but now working as faculty in the pediatric intensive care unit at the University of California Medical Center at Davis. Dr. Plant is an expert in medical education

with particular reference to pediatric critical care scenarios. She retains a Masters Degree in Medical Education in addition to being a board certified pediatric intensivist.

Using Delphi methodology, we completed our assessment of the physician and nursing focus groups for the Severe Sepsis Management algorithm. Eight clinical faculty and 11 nurses from the pediatric intensive care unit, inpatient wards, hematology/oncology and emergency department were interviewed (2011 Q4). All interviews were recorded and transcripts reviewed by at least 2 investigators for major theme determinations. Interestingly, many of the barriers to implementation of the time-sensitive severe sepsis management algorithm were NOT potentially improved by the addition of EMR CDS including 1) general unfamiliarity with the guidelines, 2) time sensitive strategies felt delayed due to inability to obtain timely IV access and/or unwillingness to place an intraosseous line, 3) concern that rapid fluid administration would result in pulmonary edema or IV loss and 4) hesitation to start vasoactive medications in peripheral IVs. Importantly barriers that *would* potentially be amenable to improvement with the assistance of EMR CDS were also identified including 1) recognition of severe sepsis/septic shock, particularly with regard to patients meeting Surviving Sepsis Campaign vital sign requirements, and for those patients already being managed on the severe sepsis/shock algorithm, 2) assistance with time management and completion of required severe sepsis algorithm tasks. These findings are very important as they highlight that for most effective EMR CDS development, a detailed assessment of barriers is necessary to assist in addressing hospital-wide systems issues that are NOT amenable to EMR CDS, else any EMR CDS that is developed will fail at the outset.

Future Work Specific Aim 3:

With the assistance of Dr. Plant from UC Davis, we are actively planning for the Fall 2012 follow-up focus groups with physician and nursing staff. This next set of physician and nurse focus groups will be held in Q4 and will include a reassessment of clinician understanding of the Surviving Sepsis management algorithms, as well as exploratory analysis to determine residual systems issues to be "debunked." Dr. Plant is also assisting us in developing analyses to determine the "optimal number of prompts" to the "optimal end users" at the "optimal time" in the course of the patient's sepsis trajectory as our paper CDS tool is converted to an interactive, EMR based CDS tool.

Key Research Accomplishments

1) Phase 1 patient screening, enrolling and data collection has been completed.
2) Phase 2 portion solidly underway with great strides in paper based clinical decision support methodology currently being applied hospital-wide.
3) Planning for Phase 3 has begun with our investigative team and key EPIC EMR personnel to "translate" paper based clinical decision support tools into interactive "smart" decision support tools shortly after Epic hospital-wide "go live" date in Fall 2013.
4) Key relationships created with National American Heart Association Pediatric Advanced Life Support leadership indicating our methodology of incorporating

severe sepsis/septic shock management in conjunction with advanced life support education may become a nation-wide paradigm in the future.

5) Results of first nurse and physician focus groups presented at national meeting for Society for Pediatric Research.

Reportable Outcomes

1) We successfully presented our preliminary analysis of factors shaping clinician implementation of time-sensitive, clinical decision support for management of patients in severe sepsis/septic shock at the 2012 Society for Pediatric Research National Meetings in Boston, Massachusetts. Interestingly, many of the barriers to implementation of the time-sensitive, severe sepsis management algorithm were NOT potentially improved by the addition of EMR CDS, although a significant portion of the barriers would potentially be amenable to improvement with the assistance of EMR CDS. This finding is very important as it highlights that for most effective EMR CDS development, a detailed assessment of "systems" and "cultural" barriers is necessary to assist in addressing hospital-wide systems issues that are NOT amenable to EMR CDS - else any EMR CDS that is developed will fail at the outset. (Abstract attached.)

2) This project has been presented as a CHRCO Grand Rounds lecture on clinical decision support tools for management of time-sensitive, critical pediatric illness on 1/31/2012.

Timeline Modification

As described in the "Problems" section above, Children's Hospital and Research Center Oakland continues to actively transition to the EPIC EMR platform. The estimated "go live" date remains Fall/Winter 2013. With the new "go live" date of September, 2013, we have extended the project timeline. From a research perspective, this extended timeline for the Epic conversion is very beneficial as it has allowed us an excellent opportunity to enroll more patients in each study cohort, which in turn allows for improved analysis of the incremental changes observed in patient outcome and management algorithm compliance across each of the study phases and for both patient cohorts (pediatric sepsis/septic shock patients and for very low birth weight infants).

The revised timeline for the combined **AWARD#W81XWH-09-01-0704** and **AWARD#W81XWH-10-01-0682** is shown below:

Revised Project Timeline (note that **AWARD#W81XWH-10-01-0682** funding starts September, 2011)

- Phase 1 (Baseline) Apr 2010 - Sep 2011 (18 months)
- Phase 2 (Paper CPG) Oct 2011 - Sep 2013 (24 months)
- Phase 3 (EMR) Oct 2013 - Sep 2015 (24 months)

Budget Modification

With the revision of the timeline for **AWARD#W81XWH-10-01-0682**, we are proposing to extend the budget to cover the period of September, 2011 to September, 2015. With this lengthening of the project, we have adjusted % effort of the study personnel so that the entire project will be completed within the amount originally awarded.

Please see revised budget proposal.

Change in Project PI

Last year, we proposed changing the PI from Dr. Durand to Dr. Flori. This change has been approved this past summer by Mr. Robert Connors, our original GOR. We await second approval for this transition by Dr. Stefferson, our new GOR. Dr. Flori has been completing and submitting all necessary paperwork (quarterly reports and budget/budget justification paperwork) to our TATRC liasons since the last annual report was submitted in February 2012.

Conclusions:

Many hospitals are transitioning to electronic healthcare platforms. With the expanse of patient data that are continuously captured within these electronic healthcare records (EHR), development of adequately explicit clinical decision support (CDS) tools should be able to be created, above and beyond the computerized physician order entry (CPOE) that has been relatively rudimentally applied to date. The critical care population stands to both gain and lose the most in these transitions as many time-sensitive management algorithms currently exist and continue to be developed. Properly designed and implemented, these CDS algorithms have the potential to save lives. Hastily applied and/or with incomplete understanding of the human factors and systems issues involved in making these CDS successful, patients suffer iatrogenic death instead. Our concept protocols strive to examine both short term (minutes to hours) management algorithms (Specific Aims 1 and 3) in pediatric septic shock patients as well as longer term (days) algorithms (Specific Aim 2) in very low birth weight infants with complex nutritional needs. The progress reported in this Annual Report indicate that we are well on our way to completing our stated goals. Importantly, our first set of focus groups also highlighted that although many aspects to successful management of acutely unstable sepsis patients are amenable to EMR with CDS, still many human and systems factors exist that must be debunked before application of the EMR with CDS could ever prove successful. This past year, our concepts gained national interest both at the Society for Pediatric Research meetings and with pediatric leaders of the American Heart Association. Success in our concept protocol development could easily "trickle up and out" to time sensitive CDS algorithms in adults and other pediatric areas (ex. traumatic brain injury, multi-system organ failure, stroke, cardiac arrhythmia, etc.).

Relevant References:

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Appendices:

1) Correspondence with PALS leadership.
2) Copy of poster presented at 2012 Society for Pediatric Research meetings.
3) Severe Sepsis Assessment Tool
4) Severe Sepsis/Septic Shock Management Algorithm

Supporting Data: none

Appendix for W81XWH-10-0682
Electronic communication regarding adding Surviving Sepsis Campaign Guidelines Tool to Standard Pedaitric Advanced Life Support (PALS) trainaing.
Communication from leadership of American Heart Association PALS Subcommittee Leadership
April 2012

From: Allan DeCaen [mailto:Allan.DeCaen@albertahealthservices.ca]
Sent: Thursday, April 26, 2012 11:38 PM
To: Nadkarni, VINAY M; Heidi Flori
Cc: Meaney, Peter A; Robinson, Roni L; Donoghue, Aaron J; Marc Berg
Subject: Re: hey - quick question re Surv Sepsis and PALS recs

Very much willing to look at this. Although CHOP has blazed the trail of broadening PEARS/ PALS content past the traditional content, I think that wider use of this approach (ie. More than just the AHA curriculum) is something that will entail a little more 'discussion' with AHA. There has for a long time been the mentality that "thou shalt not wander form the set PALS curriculum". I think that if we play the card correctly with AHA, consideration of broader 'learner/ group-specific material' might be accepted by AHA. Only caution is that we don't want PALS looking like totally different courses dependent upon what part of the country/ world that the course is provided, do we? (opening this up for further discussion/ input from all of you???)

Allan

From: <Nadkarni>, Vinay Nadkarni <nadkarni@email.chop.edu<mailto:nadkarni@email.chop.edu>>
To: Heidi Flori <HFlori@mail.cho.org<mailto:HFlori@mail.cho.org>>
Cc: "Meaney, Peter A" <MEANEY@email.chop.edu<mailto:MEANEY@email.chop.edu>>, "Robinson, Roni L" <ROBINSONR@email.chop.edu<mailto:ROBINSONR@email.chop.edu>>, Aaron Donoghue <DONOGHUE@email.chop.edu<mailto:DONOGHUE@email.chop.edu>>, Allan de Caen <allan.decaen@albertahealthservices.ca<mailto:allan.decaen@albertahealthservices.ca>>, Marc Berg <marcb@peds.arizona.edu<mailto:marcb@peds.arizona.edu>>
Subject: RE: hey - quick question re Surv Sepsis and PALS recs

Yes???we have incorporated it into our PEARS training for our pre-ICU staff in the hospital???.Peter Meaney and Roni Robinson have been the leads???.Aaron Donoghue is trying to think of ways we can weave this into the PALS curriculum.
Good idea???and if you have suggestions on ways to do it, perhaps you could come and present to the PALS subcommittee???Allan DeCaen runs the group now and is very receptive to such ideas.

vinay

From: Heidi Flori [mailto:HFlori@mail.cho.org]
Sent: Wednesday, April 25, 2012 7:10 PM
To: Nadkarni, VINAY M
Subject: hey - quick question re Surv Sepsis and PALS recs

Hi Vinay,
I know you must be swamped but want to ask you a quick question while you are wearing your PALS/American Heart Assoc hat.

We are trying to regroup and improve our hosp wide response to severe sepsis/shock patients. We felt that perhaps our hosp wide Surv Sepsis CPG could dovetail nicely with the PALS education on septic shock but wanted to know if PALS had thoughts on how to do that in a way that would augment PALS teaching and not detract from it (ie by saying here is our sepsis cpg but you won;t be tested on it in PALS right now...) The PALS groups are such a captive audience that it seems a shame to waste the opportunity?

Am I making sense?

Heidi

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Barriers to Implementation of Time-Sensitive Clinical DecisionSupport in an Electronic Medical Record

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Introduction

- Many medical centers are migrating toward the use of an Electronic Medical Record (EMR).
- Despite potential for improvement in clinical decision support (CDS) techniques, some pediatric critical care units have noted adverse outcomes, even increase in mortality, after EMR implementation. (Pediatr 2005;116)

Objectives

- To identify optimal implementation strategies for time-sensitive CDS in the management of critically ill children.
- To identify systems issues, areas of health care professional discomfort and barriers to implementation of Surviving Sepsis Campaign guidelines (CCM 2008;36) at CHRCO.
- To identify barriers to implementation that would be amenable to improvement with an EMR with CDS.

Methods

- Physician faculty interviews (n=8) and nursing focus groups (n=11) from the Emergency, Inpatient Pediatric, Hematology/ Oncology and Critical Care Departments.
- All focus groups and interviews were recorded and transcribed.
- Transcripts were reviewed by at least 2 investigators and themes independently generated and reconciled.
- Physician interviews assisted in development and refinement of a hospital-wide Surviving Sepsis Clinical Practice Guideline (CPG).
- Nursing focus groups occurred after the initial development of the Surviving Sepsis CPG. These interviews and focus groups were instrumental in further refining and finalizing the CPG.
- Themes potentially amenable to CDS in an EMR are listed in orange font.

Results

- **PHYSICIAN MAJOR THEMES:**
- Pediatricians of various specialties are generally unfamiliar with the Surviving Sepsis Guidelines, however, when presented with them, there is general agreement with them.
- There is frequently a delay in the recognition of shock, especially when it is compensated.
- Nursing "buy-in" is necessary for the CPG to be effective.
- The treatment of septic patients does not occur in a timely fashion, frequently due to lack of personnel and resources.
- Barriers to prompt treatment:
  - inability to obtain adequate IV access
  - a delay in placement of an IO line
- General hesitancy to bolus IV fluids too aggressively due to a concern for causing pulmonary edema and/or losing IV access.

"In an ideal world, a team would get triggered."

"An EMR would be helpful in terms of early recognition of sepsis by vital signs."

- **NURSING MAJOR THEMES:**
- There is a need for a CPG and it could be helpful when treating septic patients.
- It is challenging to identify a patient in shock.
- Nurses need the authority to initiate the CPG and comfort in initiating this treatment plan.
- On the wards, there is frequently a delay in response from other providers (MD/RT) and a lack of the necessary medications (antibiotics) and equipment (medication pumps/IO…).
- Barriers to prompt treatment:
  - inability to obtain adequate IV access
  - a delay in placement of an IO line
- General hesitancy to bolus IV fluids too aggressively due to general inexperience with pushing fluids by hand and a concern for causing pulmonary edema or causing loss of IV access.
- General hesitancy to start vasoactive medications through a peripheral IV and/or on the pediatric wards.
- The SSG time points may be unrealistic. Time management during the resuscitation is difficult.

Discussion

- Both physician and nursing groups independently identified similar themes and barriers to successful implementation of the Surviving Sepsis Campaign guidelines.
- Institution of a Rapid Response Team specific for the treatment of pediatric patients with severe sepsis/septic shock could improve timeliness of interventions as well as availability of necessary personnel, equipment and supplies for appropriate sepsis resuscitation.
- There is great need for hospital-wide education about the SSG guidelines and improving healthcare professional comfort with the treatment of pediatric septic shock.
- Some issues (identification of patients with septic shock and time management during sepsis resuscitation) are potentially amenable to improvement with the development of adequate clinical decision support in an EMR.

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